



SWEETFUEL Project



Sweet Sorghum
an alternative energy Crop

www.sweetfuel-project.eu





Why producing ethanol from sorghum ?



Sugar cane

Tropical zone

VS



Sweet sorghum

Propagation
Cuttings seeds

Length of cycle
12-16 months 4-5 months

Water requirements
36 000 m³ 8000 m³

Adaptation to dry zones
Irrigation yes

Adaptation to marginal soils
cane << sorghum

Grain production
0 >> 2T

Ethanol production (l ha⁻¹)
6500 5600

Uses
Fuel Food, Feed, Fu

→ **ADVANTAGE SORGHUM**



Sorghum

Temperate zone

VS



Maize

Intrant needs
sorghum << maize

WUE (kg H₂O kg⁻¹ DM)
310 | 370

Nitrogen Use Efficiency
sorghum >> maize

Adaptation to dry environments
sorghum >> maize

Adaptation to marginal soils
sorghum >> maize

Biomass
sorghum ↔ maize
(30TDM ha⁻¹)

→ **ADVANTAGE SORGHUM**

Huge potential of improvement
Respect of environment
Development of rural zones
Low competition with food crop
Better sustainability of the production system





Text of the FP7 call

KBBE-2008-3-1-02: **Sweet sorghum - An alternative energy crop for biofuel production in semi-arid and temperate regions - SICA (Latin America, South Africa, India)**

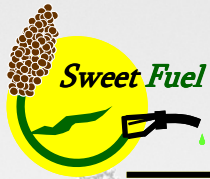
Sweet sorghum is a promising alternative crop for bioethanol production. Moreover, it is a "food-fuel-energy-industrial crop" which ranks fifth among the world's grain crops, requires low water/fertilisers input, has a high yield of grains and biomass (starch/sugars/lignocellulosics) for integrated multi-purpose processing and grows well in marginal lands, in semi-arid and temperate regions, including Africa, India, Latin America and Europe. A limiting factor for its widespread cultivation is the lack of varieties adapted to different growth conditions, including colder climate. Consequently research should address the optimisation of sweet sorghum as an energy crop through breeding. Besides biomass yield and relevant quality traits, genetic improvement/selection should concentrate on general agronomic traits (such as water and nutrient use efficiency) and, in particular, adaptation of sweet sorghum to colder climates. The project should also address agronomic practices and harvesting technologies leading to improved yield, quality, sustainability and competitiveness of sweet sorghum production. Environmental and economic analysis of sweet sorghum cultivation, including energy balance and life cycle assessment, should also be carried out. International co-operation with third countries leading in biofuel production and energy crops will be an essential added value.

Funding scheme: Small collaborative project

Additional information: SICA - Specific International Cooperation Action. The project is expected to contribute to international co-operation with third countries signatories of S&T agreements with the EU from Latin America as well as from South Africa and India. Minimum number of participants: two from two different MS or AC plus two from Latin America, one from South Africa and one from India.

Expected impact: Great market potential, as sweet sorghum is a potentially cheap feedstock for ethanol, also in the EU. Important environmental benefits (low water input) and good perspectives for the development of rural areas.





Partnership (1/2)

Partner 1
Coordinator
WP4 and WP8 leader



Centre de coopération internationale en recherche agronomique pour le développement (CIRAD / France)

Partner 2
WP2 leader



International Crops Research Institute for Semi-Arid Tropics (ICRISAT / India)

Partner 3
WP3 leader



EMBRAPA Maize and Sorghum (Brazil)

Partner 4
WP1 leader



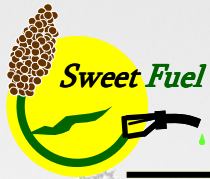
KWS SAAT AG (Germany)

Partner 5
WP6 leader



IFEU - Institute for Energy and Environmental Research Heidelberg, Germany





Partnership (2/2)

Partner 6
WP5 leader



Alma Mater Studiorum - Università di Bologna
(UNIBO / Italy)

Partner 7



Università Cattolica del Sacro Cuore (UCSC / Italy)

Partner 8



Agricultural Research Council - Grain Crop Institute
(ARC-GCI / South Africa)

Partner 9



Universidad Autónoma de Nuevo León
(UANL / Mexico)

Partner 10
WP7 leader



WIP - Renewable Energies (WIP / Germany)



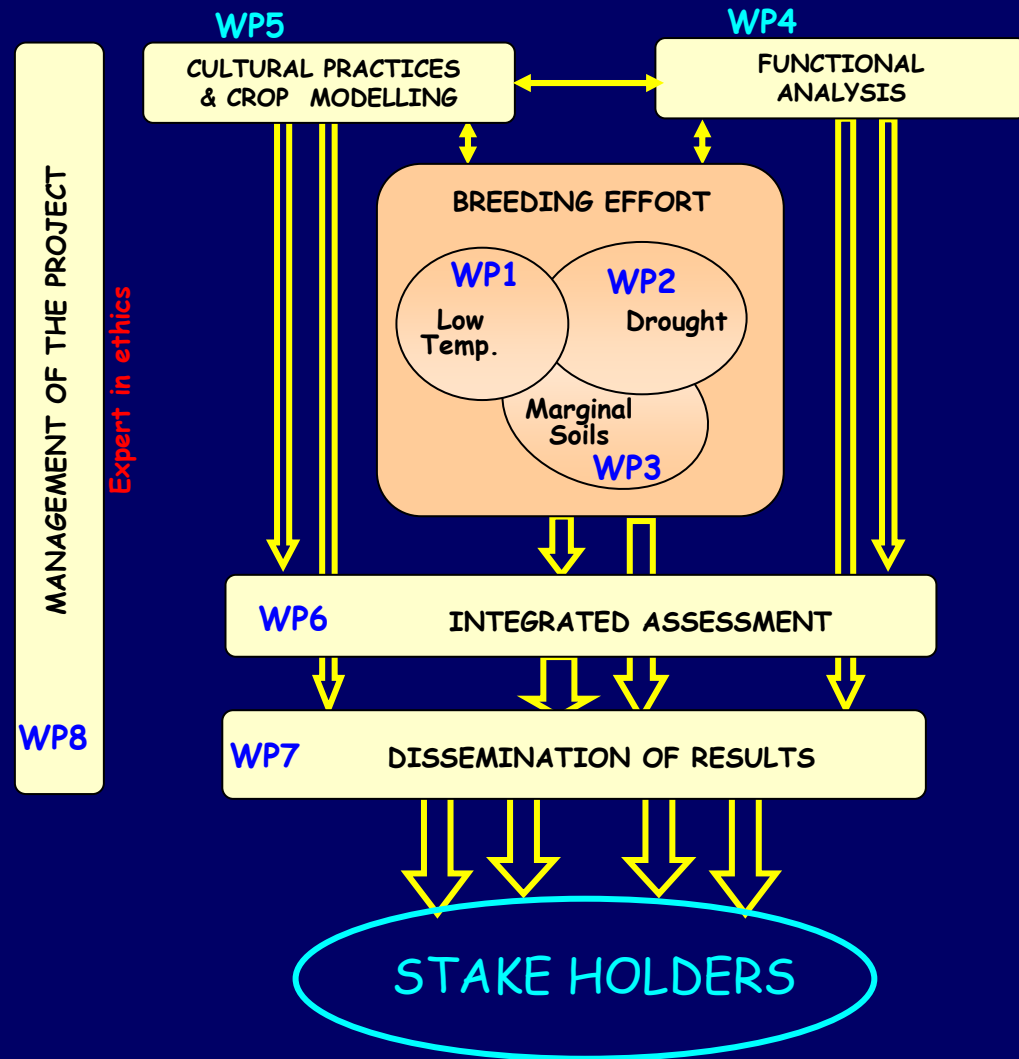


Budget and organization of WPs

Distribution of the total budget

(Total budget = 4 950 937 €)

Breeding effort:	WP1 = 20%
	WP2 = 12%
	WP3 = 14%
Func. Analysis & ...	WP4 = 15%
Cult. Pract. &...	WP5 = 13%
Integrated assess.	WP6 = 12%
Dissemination...	WP7 = 6%
Management...	WP8 = 8%





Objectives (1/2)

The general objective is to develop bioethanol production in temperate and semi-arid regions from sweet sorghum through genetic enhancement and improvement of cultural and harverst practices.

Specific objectives of breeding programmes **WP1**, **WP2** and **WP3** are to develop new sorghum lines or hybrids. The target ideotype depends on the target environment as well as the system of transformation

Target ideotype for WP1

Sorghum with high biomass, good adaptation to low temperature and good digestibility (low content of lignin, *bmr* trait)
⇒ suitable for 2nd generation bioethanol

Target ideotype for WP2

Double purpose sorghum (grain + sugars) suitable for humane and/or animal feeding, with a good drought adaptation, juicy stalks with high sugar content and good digestibility
⇒ suitable for 1st generation bioethanol

Target ideotype for WP3

Double purpose sorghum (grain + sugars) suitable for humane and/or animal feeding, with a good adaptation to marginal soils (acidity, high Al, low P) and good digestibility
⇒ suitable for 1st generation bioethanol





Objectives (2/2)

Other specific objectives of SweetFuel are:

WP4

Improve our knowledge on the accumulation of sugars (trade offs with grain and biomasse production, key enzymes...) and the relationships among traits for sugar accumulation, plant phenology, stay-green and terminal drought tolerance

WP5

Understand the agronomic determinants of optimized yield and recommande the best cultural and harvest techniques

Elaborate a plant model for sweet sorghum to identify potential area for production

WP6

Provide a multicriteria evaluation of the sustainability of the bioethanol production from sweet sorghum on a social, economic and environmental point of view

WP7

Promote the exchanges between RTD experts, stakeholders and key actors
Elaborate a detailed exploitation plan

WP8

Identify and monitor evolution of the ethical risks due to the development of ethanol production from sweet sorghum and propose guidelines for policy makers





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